

WHAT IS CLAIMED IS:

1. A method of making an article, comprising:
forming a first alignment layer on a surface of a polarizing element;
disposing a liquid crystal material on the first alignment layer; and
forming an aligned liquid crystal layer from the liquid crystal material to produce a polarization rotator element.
2. The method of claim 1, wherein forming a first alignment layer comprises forming a first alignment layer from a portion of the polarizing element.
3. The method of claim 2, wherein forming a first alignment layer comprises stretching at least a portion of the polarizing element to form an aligned surface.
4. The method of claim 1, wherein forming a first alignment layer comprises forming a first alignment layer on the polarizing element.
5. The method of claim 1, further comprising disposing a second alignment layer on the liquid crystal material.
6. The method of claim 5, wherein disposing a second alignment layer comprises forming a second alignment layer on the liquid crystal material.
7. The method of claim 5, wherein disposing a second alignment layer comprises forming the second alignment layer on a substrate and disposing the second alignment layer and substrate on the liquid crystal material.

8. The method of claim 7, further comprising disposing liquid crystal material on the second alignment layer and contacting the liquid crystal material on the second alignment layer with the liquid crystal material on the first alignment layer.

9. The method of claim 7, wherein forming the second alignment layer on a substrate comprises forming the second alignment layer on a substrate comprising a second polarizing element.

10. The method of claim 9, wherein forming an aligned liquid crystal layer comprises forming an aligned liquid crystal layer from the liquid crystal material, wherein the aligned liquid crystal layer is configured and arranged to rotate a polarization of light normally incident on the aligned liquid crystal layer from a polarization axis of the polarizing element to the polarization axis of the second polarizing element which differs by at least 5 degrees.

11. The method of claim 10, wherein forming an aligned liquid crystal layer comprises forming the aligned liquid crystal layer with a twist angle that is substantially small than a phase retardation of the aligned liquid crystal layer.

12. The method of claim 1, wherein forming an aligned liquid crystal layer comprises forming an aligned liquid crystal layer from the liquid crystal material, wherein the aligned liquid crystal layer is configured and arranged to rotate a polarization of light normally incident on the aligned liquid crystal layer by at least 5 degrees.

13. The method of claim 12, wherein forming an aligned liquid crystal layer comprises forming the aligned liquid crystal layer with a twist angle that is substantially small than a phase retardation of the aligned liquid crystal layer.

14. The method of claim 12, wherein forming an aligned liquid crystal layer comprises forming an aligned liquid crystal layer using only a single alignment layer.

15. A method of making an article, comprising:
forming a first alignment layer on a surface of a polarizing element;
disposing a liquid crystal material on the first alignment layer;
disposing at least one additional layer on the liquid crystal material; and
directing light through the at least one additional layer to the liquid crystal material to cure the liquid crystal material and form an aligned liquid crystal layer to produce a polarization rotator element.

16. The method of claim 15, wherein disposing at least one additional layer comprises disposing a second alignment layer on the liquid crystal material.

17. The method of claim 16, wherein disposing a second alignment layer comprises forming the second alignment layer on a substrate and disposing the second alignment layer and substrate on the liquid crystal material.

18. The method of claim 16, wherein disposing a second alignment layer and directing light comprise
disposing a photo-orientable material on the liquid crystal material; and
directing polarized light at an orientation direction through the photo-orientable material to the liquid crystal material to cure and orient the photo-orientable material at the orientation direction to form the second alignment layer and to cure the liquid crystal material and form an aligned liquid crystal layer to produce a polarization rotator element.

19. The method of claim 16, wherein forming a first alignment layer, disposing a second alignment layer, and directing light comprise

disposing a first photo-orientable material on the surface of the polarizing element;

disposing a second photo-orientable material on the liquid crystal material; and

directing polarized light at an orientation direction through the second photo-orientable material to the liquid crystal material and the first photo-orientable material to a) cure and orient the first photo-orientable material at the orientation direction to form the first alignment layer, b) cure and orient the second photo-orientable material at the orientation direction to form the second alignment layer, and c) cure the liquid crystal material and form an aligned liquid crystal layer to produce a polarization rotator element.

21. The method of claim 15, wherein directing light comprises directing ultraviolet light through the at least one additional layer to the liquid crystal material to cure the liquid crystal material and form an aligned liquid crystal layer to produce a polarization rotator element.

22. A method of making an article, comprising:
unwinding a first film comprising a polarizing element;
forming a first alignment layer on a surface of the polarizing element;
disposing a liquid crystal material on the first alignment layer;
unwinding a second film;
forming a second alignment layer on a surface of the second film;
contacting the first and second films so that the liquid crystal material is disposed between the first and second alignment layers; and
forming an aligned liquid crystal layer from the liquid crystal material to produce a polarization rotator element.

23. The method of claim 22, further comprising forming a liquid crystal material on the second alignment layer prior to contacting the first and second films.

24. The method of claim 22, wherein forming an aligned liquid crystal layer comprises directing light through the second film and second alignment layer to the liquid crystal material to cure the liquid crystal material and form an aligned liquid crystal layer to produce a polarization rotator element.

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